

What is claim d is:

1. A substrate support ring comprising:

(a) a band comprising an inner perimeter to at least partially surround a periphery of the substrate, the band comprising a radiation absorption surface; and

(b) a lip extending radially inwardly from the inner perimeter of the band to support the substrate,

wherein the band and lip comprise silicon carbide, and

wherein the radiation absorption surface comprises a layer of oxidized silicon carbide.

2. A ring according to claim 1 wherein the band and lip comprise a sintered composition of silicon carbide and nitrogen.

3. A ring according to claim 2 wherein the sintered composition comprises a nitrogen content that is sufficiently high such that the sintered composition is substantially opaque to incident radiation.

4. A ring according to claim 1 wherein the band and lip comprise a combined thermal mass T_m , and wherein the radiation absorption surface comprises an absorptivity A and a surface area S_a , such that the ratio $(A \times S_a)/T_m$ is from about 4×10^{-5} $\text{m}^2\text{K}/\text{J}$ to about 9×10^{-4} $\text{m}^2\text{K}/\text{J}$.

5. A ring according to claim 4 wherein the radiation absorption surface comprises an absorptivity A and a surface area S_a , such that the ratio $(A \times S_a)/T_m$ is from about 5.2×10^{-4} K/J to about 7.6×10^{-4} K/J .

6. A ring according to claim 1 wherein the radiation absorption surface comprises an absorptivity of from about 0.1 to about 1.0, and a surface area of from about 2×10^{-3} m^2 to about 3×10^{-2} m^2 .

7. A ring according to claim 1 wherein the band and lip comprise a heat capacity of from about 900 J/Kg/K to about 1300 J/Kg/K, and wherein the thermal mass is from about 2 J/K to about 750 J/K.

8. A process chamber comprising:

- (i) a process gas supply and exhaust;
- (ii) a substrate support ring according to claim 1; and
- (iii) a radiation source to direct radiation onto the substrate and radiation absorption surface of the ring; and
- (iv) an exhaust.

9. A substrate support ring comprising:

- (a) a band comprising an inner perimeter to at least partially surround a periphery of the substrate, the band comprising a radiation absorption surface; and
- (b) a lip extending radially inwardly from the inner perimeter of the band,

wherein the band and lip comprise a combined thermal mass T_m , and

wherein the radiation absorption surface comprises an absorptivity A and a surface area S_a , such that the ratio $(A \times S_a)/T_m$ is from about $4 \times 10^{-5} \text{ m}^2\text{K/J}$ to about $9 \times 10^{-4} \text{ m}^2\text{K/J}$.

10. A ring according to claim 9 wherein the radiation absorption surface comprises an absorptivity A and a surface area S_a , such that the ratio $(A \times S_a)/T_m$ is from about $5.2 \times 10^{-4} \text{ K/J}$ to about $7.6 \times 10^{-4} \text{ K/J}$.

11. A ring according to claim 9 wherein the radiation absorption surface comprises an absorptivity of from about 0.1 to about 1.0, and a surface area of from about $2 \times 10^{-3} \text{ m}^2$ to about $3 \times 10^{-2} \text{ m}^2$.

12. A ring according to claim 9 wherein the band and lip comprise silicon carbide, and wherein the radiation absorption surface of the band comprises an oxidized layer of the silicon carbide.

13. A ring according to claim 12 wherein the band and lip comprise a sintered composition of silicon carbide and nitrogen.

14. A method of fabricating a substrate support ring to support a substrate in a process chamber, the substrate comprising a thermal mass T_{ms} , and a top surface having an absorptivity A_s , and a surface area S_{as} , wherein the substrate comprises a substrate heating rate value comprising $(A_s \times S_{as})/T_{ms}$, the fabrication method comprising:

(a) forming a band comprising an inner perimeter to at least partially surround a periphery of the substrate, and forming a lip extending radially inwardly from the inner perimeter of the band, the band and lip comprising a combined thermal mass T_{mr} and having a support ring heating rate value comprising $(A_r \times S_{ar})/T_{mr}$; and

(b) forming a radiation absorption surface on the band, the radiation absorption surface comprising an absorptivity A_r and surface area S_{ar} , such that the ratio of the support ring heating value to the substrate heating rate value is within a predetermined range.

15. A method according to claim 14 wherein the predetermined range is from about 1.05 to about 1.3.

16. A method according to claim 14 wherein the heating rate value of the support ring is within from about 5% to about 30% of the substrate heating rate value.

17. A method according to claim 14 wherein the support ring heating rate value is from about $4 \times 10^{-5} \text{ m}^2\text{K/J}$ to about $9 \times 10^{-4} \text{ m}^2\text{K/J}$.

18. A method according to claim 17 wherein the support ring heating rate value is from about $5.2 \times 10^{-4} \text{ K/J}$ to about $7.6 \times 10^{-4} \text{ K/J}$.

19. A method according to claim 14 wherein (a) comprises forming the band and lip from silicon carbide, and wherein (b) comprises forming a radiation absorption surface of the band that comprises an oxidized layer of the silicon carbide.